

Post-HIPC Growth Dynamics in Sub-Saharan Africa

Nihal Bayraktar

Hippolyte Fofack

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Abstract

Access to debt relief under the Highly Indebted Poor Country Initiative enhanced the growth performance across Sub-Saharan Africa, especially in the subset of debt-ridden low-income countries. Over the past few years, these Completion Point countries have enjoyed significantly higher investments and growth rates, primarily fueled by the expanding fiscal space of the post-Highly Indebted Poor Country Initiative era. They are also weathering the adverse effects of the global crisis much better than their non-Highly Indebted Poor Country Initiative counterparts. Despite these growth rebounds, the region is not likely to meet the Millennium Development Goals, however. Long-term growth projections from a simple macroeconomic model,

which is applied to Ethiopia, suggest that prospects for reversing the widening income gaps with other regions of the developing world are limited. Under the baseline scenario, assuming current growth trends, the estimates show that it could take more than five decades for per capita real income to double in Ethiopia. However, even these gloomy prospects are likely to be undermined by the looming risk of another sovereign debt crisis. In effect, the experiments show that lowering interest rates on external debt would not bridge the widening income gap with other regions of the world, unless it is accompanied by a rapid expansion of capital accumulation financed by sustained inflows of foreign aid.

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Post-HIPC Growth Dynamics in Sub-Saharan Africa¹

Nihal Bayraktar* and Hippolyte Fofack**

** Associate Professor of Economics, Penn State University*

*** Senior Economist, The World Bank Group*

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I Introduction

One of the main criticisms often voiced against structural adjustment programs is the sustained increases in external liabilities during program implementation in the majority of countries in the developing world (Parfitt and Riley, 1989; Easterly, 2002). Across Sub-Saharan Africa, the debt burden of adjustments has been even heavier, with the stock of external liabilities growing to unsustainable levels (Nafziger, 1993; Elbadawi et al., 1997). In effect, expressed as a percentage of exports, the average stock of external debt increased continuously across low-income countries in the region, rising from less than 50 percent in the mid-1970s to more than 250 percent by the mid-1990s in numerous countries (Boote and Thugge, 1997).²

The rising trend of external liabilities during the implementation of adjustment programs throughout Sub-Saharan Africa reflects both persistence of large structural deficits, especially balance of payments deficits, and increasing reliance on external financing to close the financing gap. Indeed, in order to secure a continuously stable stream of resource flows in a context of fiscal and balance-of-payment crises, most countries had to avoid falling into arrears. In practice, in the absence of domestic capital markets, the dreadful near-default option illustrated by a build-up of arrears was often aborted by further increases in the stock of sovereign debt owed to external creditors, particularly in countries with limited fiscal space.

Over time, the sustained accumulation of external liabilities resulted in debt overhang, when the level of external debt became unsustainable (Elbadawi et al., 1997; Pattillo et al., 2002).³ Nevertheless, even before the debt-overhang status of countries, the costs and adverse effects of rising external liabilities were already hard felt across the region. Particularly affected were low-income and conflict-affected countries where public and private investment rates fell to all-time low levels (Akyuz and Gore, 2001).

The large scale of external liabilities acted as a deterrent and disincentive to private capital accumulation, especially as rational and risk-averse investors built into their expectations potential increases in taxes to service pre-existing debts. The adverse effects of debt overhang on public investments were also direct, as countries that faced severe revenue shortfalls often leaned on public capital expenditure programs, drawing on the fact that the benefits of public investments, especially infrastructure projects, have been spread over a longer term horizon (Bayraktar and Fofack, 2007; Ayogu, 2007).⁴

Against this backdrop, debt cancellation under the Highly Indebted Poor Country (HIPC) Initiative emerged as a salutary option to broaden the fiscal space. For completion point countries, it reduced interest payments and expected tax burdens. Furthermore, the result of debt-relief-induced greater fiscal space has been the rise in public investments. Unlike the adjustment era, which was essentially characterized by anemic and negative economic growth, the post-HIPC era has been characterized by the resumption of positive economic growth fueled by strong investment rates (IMF, 2009b; Kasekende et al., 2010).

Economic growth rates across post-HIPC Completion Point countries within the region have averaged 5.0% over the past decade. Despite the adverse effects of external shocks, and particularly the second-round effects of the 2008 global economic and financial crisis, most countries still managed to achieve positive

² The average across the subset of Sub-Saharan African conflict-affected countries is even higher. The stock of external liabilities exceeded 250% of GDP in these countries in 1995, though the scale of these liabilities has reduced significantly since the accession of countries to debt relief under the Enhanced HIPC Initiative (Fofack, 2010).

³ According to Krugman's definition (1988), a country suffers from debt overhang when the expected present value of future country transfers is less than the current face value of its debt.

⁴ Of course, in Sub-Saharan Africa, where initial conditions were already characterized by the absence or poor infrastructure, the long-term costs of cuts in public investments were even more serious.

growth rates, albeit significantly below pre-crisis projected growth averages (IMF, 2009a).⁵ These potential benefits of debt relief for borrowing countries (in terms of economic growth) suggest that most highly indebted poor countries within the region might indeed have been located on the wrong side of the debt Laffer curve, meaning that higher debt has been hurting economic growth.

However, in addition to the exposure to external shocks, post-HIPC growth rates have also suffered from excess growth volatility, reflecting the rather anemic nature of the growth process. The observed volatility is likely to affect long-run growth and, more generally, prospects for meeting the first millennium development goals of halving poverty by 2015 in the region. At the same time, external debt figures have shown a renewed increasing trend in a number of countries, with a rapid deterioration of HIPCs' debt-threshold indicators (World Bank, 2006). This trend has raised concerns about the risks of another sovereign debt crisis in the post-HIPC across the region.

This paper fills an important gap in the literature by proposing a quantitative macroeconomic model that captures the links between growth, foreign aid, and external debt in the post-HIPC era. The structural model allows one to better understand the various channels through which foreign aid and external debt may impact growth. One of the main features of the model is the production function that incorporates the effects of public capital, and the productivity of private capital and labor on output. Also significant is the adjustment of the balance of payment equation to account for excessive reliance on external resources to bridge financing gaps.

The objective of this paper is to quantify the HIPC dividends across Sub-Saharan Africa and assess the potential risks associated with the renewed deterioration of external debt. The first part of the paper analyzes the dynamics of growth in the post-HIPC era. The second part draws on a standard macroeconomic model that accounts for financing of deficits and debt structure in the post-HIPC to assess long-run growth. The model is applied to Ethiopia. The baseline simulation of the model produces slow growth and accumulating external debt if current economic conditions continue as they are. Baseline projections are constructed, after which some experiments are run to explore the growth implications of higher foreign aid and/or lower interest payments on foreign debt, under different scenarios. The simulation results show that the optimal outcome in terms of higher economic growth depends on the sustainability and size of foreign aid and the proportion of external assistance allocated to public investments.

This research is undertaken at a time of the global review of progress toward the MDGs, almost a decade into the adoption of these goals (Go et al., 2010; Bhagwati, 2010).⁶ It is motivated by the wave of euphoria that has accompanied the resurgence of growth in the post-HIPC across Sub-Saharan Africa. In effect, global experts not only in development institutions, but also in academia have gone as far as likening Africa's recent positive growth rates to those that have transformed Asian emerging market economies into global players (Sala-i-Martin and Pinkovskiy, 2010; Devarajan and Shetty, 2010).

Although the success of Asian emerging market economies, most notably illustrated by large current account surpluses, has been predicated on major structural shifts in production possibility frontiers and industrial transformation, most African countries remain excessively dependent on natural resources and primary commodity exports (Fofack, 2010)]. Hence, the paper also attempts to shed some light on the nature and

⁵ According to IMF's estimates published in the World Economic Outlook Database, growth rates averaged 2.47% across Sub-Saharan Africa in 2009, significantly below the rates enjoyed in the pre-crisis years (about 5.5%) between 2004 and 2008.

⁶ On the occasion of that tenth anniversary of the millennium declaration, the latest issue of IMF's Finance & Development—*Restoring Hope: Reinventing the Millennium Development Goals*—is entirely devoted to the MDGs (for further details, see IMF, 2010).

quality of growth, contrasting stylized facts underpinning the growth process across the two regions. Our results may have implications for the extent to which African countries can enter the virtuous cycle of long-run growth enjoyed by Asian emerging market economies.

In effect, contrasting the growth and welfare performance of Asia's emerging market economies, the baseline projection of the model for Ethiopia suggests that under the current post-HIPC growth rates, average per capita real income will not double, even decades after the MDG target date of 2015. Worse still, a renewed deterioration of external debt thresholds in the post-HIPC era has emerged as a key constraint to the expanding fiscal space that released the critical resources needed for increased capital expenditure in support of growth and economic development.

The remainder of the paper is organized as follows. The next section analyzes the dynamics of growth in the post-HIPC era across Sub-Saharan Africa. In particular, it contrasts the growth performance between HIPC-Completion Point countries and non-HIPCs. It also contrasts Asian emerging market economies with Sub-Saharan African countries. Section III proposes a macroeconomic framework for assessing the HIPC dividends measured in terms of economic growth. In Section IV, the proposed model is applied to Ethiopia to quantify the HIPC dividends (and risks associated with resurgence of another debt cycle), and particularly estimates long-run growth and average income under certain assumptions. The last section concludes.

II Dynamics of Growth of African Economies in the Post-HIPC Era

Though highly volatile, Sub-Saharan Africa's growth spells can be divided into three main episodes: the pre-1974 oil crisis, the adjustment era which started in the mid-1970s and ran through the 1990s, and the post-HIPC era after the 1990s. The first episode running through the 1974 oil shock can also be labeled as the immediate post-independence era. Existing empirical records on that episode point to a rather strong economic performance, as average growth rates enjoyed by African countries exceeded 3% over the period (Maddison, 1995; Artadi and Sala-i-Martin, 2003).

According to Maddison (1995), the Africa region witnessed a rapid increase in income and enjoyed a relatively large contribution to global trade during that first episode. However, the relatively good performance of the region largely reflected the dichotomous trade pattern of the globalization landscape inherited from the colonial era, and still, the relatively large contribution of primary commodity and natural resources to growth under that globalization landscape. While former colonies and developing countries specialized in exports of natural resources, advanced economies dominated the production and exports of manufactured goods.

Exponential growth in manufacturing exports, however, over the past decades significantly altered these historical trade patterns (World Bank, 2002; Fofack, 2009).⁷ Under those rapidly changing trading patterns, sudden growth reversals and rising internal (savings-investment) and external (balance of payments) deficits dominated the second growth episode. A lot has been written on Africa's dismal growth performance during that episode (Easterly and Levine, 1997; Artadi and Sala-i-Martin, 2003).⁸ Artadi and Sala-i-Martin (2003)

⁷ Hence, under that old dichotomous globalization landscape, Africa essentially enjoyed the benefits of its excess natural resource endowment over other regions.

⁸ Easterly and Levine (1997) have labeled the second episode as "Africa Growth Tragedy." However, they have largely attributed the growth tragedy and poor economic outcomes to the politics of ethnic divisions and conflicts.

have characterized the growth performance of the region as the “economic *tragedy* of the twentieth century,” in reference to the rather long cycle of negative economic growth and falling real per capita income.

According to these authors the region recorded negative growth rates over that period, with the most significant growth collapse occurring in the 1990s, when the economy contracted by more than 1.5% on average. However, contraction was even more pronounced in the HIPC subset, with average growth declining by more than 5% during the same period. These countries also recorded significantly lower investment rates and larger balance of payments deficits. In percentage of GDP, balance of payments deficits averaged 2.5% in African HIPC Completion Point countries compared with 1.9% in non-HIPCs between 2005 and 2009. Ultimately, the persistent and growing deficits faced by these countries motivated the recourse to adjustment, and largely explains the exceptional rise and disproportionately higher increase in external liabilities accruing to these countries up to the late 1990s (Figure 1).

Indeed, the weak growth performance first triggered by the 1974 oil crisis was later exacerbated by recurrent adverse terms of trade and balance of payments crises across the region. Over time, invariance under that primary commodity and natural resource exports-led growth model fueled Africa’s debt crisis. The sudden growth reversals in the aftermath of the oil crisis revealed the high exposure of the region to negative terms of trade shocks (Fofack, 2010). The persistency under these adverse shocks highlighted the unsustainability of tying growth too heavily to natural resource exports.

However, the gross characterization of the region’s overall growth performance as disappointing masks important differences that may exist across countries. The contrast between the subset of HIPCs and non-HIPCs shows that growth collapse was somewhat more serious in the former.⁹ Figure 2 contrasts the dynamics of growth in HIPCs and non-HIPCs over the last few decades. Despite the trend consistency in the two distributions, on average, non-HIPCs registered higher growth rates throughout the late 1990s.

Still, the gross characterization of Sub-Saharan Africa also reflects its widening income gaps with other regions of the developing world. In fact, the problem is not so much that Sub-Saharan African countries recorded negative economic growth throughout the second episode, spanning two decades. Growth is subject to business cycles; conceivably, an output gap can become exceedingly large during downturns. Instead, the reference to economic tragedy reflects the fact that other regions of the developing world were less affected by business cycles and recorded impressive economic performances—sustained and robust economic growth and global income convergence—during the same period (Singh, 2010).¹⁰

To further illustrate this point, Figure 3 contrasts the GDP per capita of China and African HIPCs over the past four decades. Since the mid-1980s, the income gap between the two sets has grown unabated, fueled by exponential growth in China and high growth volatility in the subset of African HIPCs (Yueh, 2010). Despite the potential adverse effects of the global crisis for Asia’s export-led growth model, the growing income gap has persisted. According to the latest estimates, China now enjoys per capita income that is well over four times the average across African HIPCs, a remarkable change from the 1970s, when African countries had a significantly higher level of income.¹¹

⁹ The list of HIPCs included in the data analyses is Benin; Burkina Faso; Burundi; Cameroon; Central African Republic; Chad; Congo, Dem. Rep.; Congo, Rep.; Cote d’Ivoire; Ethiopia; Gambia; Ghana; Guinea; Liberia; Madagascar; Malawi; Mali; Mauritania; Mozambique; Niger; Rwanda; Sao Tome and Principe; Senegal; Sierra Leone; Tanzania; Uganda; and Zambia.

¹⁰ In particular, Asia’s growth performance over the past two decades has simply been phenomenal. Emerging Asia has doubled its share of world trade and tripled its share of world GDP. And projections suggest that it could become the world’s largest economic region by 2030 [Singh (2010)].

¹¹ Of course, in per capita terms, the income gap with other emerging market economies is even more significant (see Figure 1A in Annex).

While much has been written on Africa's dismal performance during the second episode, much less has been done to explain the persistent, if not continued, growing income gap between Sub-Saharan Africa and other regions of the developing world in the post-HIPC era (Oyelaran, 2007, and Newfarmer, 2009). Sub-Saharan Africa's growth rates have improved somewhat, especially since countries have had access to debt relief (Kasekende et al., 2010). The generally positive trend across the whole region probably has been boosted by the relatively strong growth rates in HIPCs, reflecting the higher investment rates—part of HIPC dividends—enjoyed by these countries in recent years.

Additionally, the diverging growth path in the years following the crisis suggests that HIPC Completion Point countries weathered the global economic and financial downturn triggered by the U.S. subprime crisis much better (Rogers, 2010). The higher growth volatility in the subset of non-HIPCs, especially after the 1990s, and persistent negative economic growth rates in the aftermath of the global downturn is in sharp contrast with the performance of HIPC-completion-point countries. Countries in the latter subset quickly reverted to pre-crisis positive growth rates (Figure 2).

At the same time, the continued widening income gap with Asian emerging market economies in the post-HIPC suggests that the growth rates enjoyed by these countries in recent years has been neither strong enough nor sustained to trigger the process of income convergence. Among several possible reasons, most notable is the resurgence of growth in these countries, which has not been accompanied by the type of structural transformation observed in Asia (Nelson and Pack, 1999; Fofack, 2010).

In particular, Asian emerging markets have drawn on sustained accumulation of physical and human capital and adoption of advanced technology to raise productivity and expand the scope of manufactured goods in overall output.¹² The successful integration of Asian emerging market economies into the global economy—most notably illustrated by their entry into the convergence club—has been predicated on remarkable shifts in production possibility frontiers and industrial output expansion, with manufacturing becoming the basis for long-run growth (World Bank, 2002).

In contrast, the overwhelming majority of countries in the Sub-Saharan Africa region have continued to depend largely on commodity and natural resources, though the contribution of natural resources to growth was becoming less determinant under the new globalization landscape dominated by manufacturing exports and knowledge (Fofack, 2009). In the extreme cases of excess dependency on natural resources (Angola, for instance), proceeds from these resources accounted for more than 90% of exports and 50% of GDP. Reflecting that invariance in the sources of growth, the taxonomy of African economies remains fundamentally shaped by the extent of natural resources.

III Analytical Framework

The analytical framework is derived from the model developed in Agénor, Bayraktar, and El Aynaoui (2008). The proposed framework investigates the growth path of countries after debt cancellation, and conversely the adverse effects of rising external liabilities on growth. The expected impact of debt cancellation on the economy goes through increased public savings and government revenues, largely owing to lower interest

¹² In particular, successful Asian emerging market economies have implemented effective policies and built strong institutions in support of growth. Some of these policies have served as catalysts for foreign direct investment by emphasizing saving and investment spending, especially in infrastructure and education, and the adoption of advanced technology.

payments on foreign debt. To understand the effects of lower interest payments or higher foreign aid, we consider different options in allocation of additional savings accruing to governments in the post-HIPC era. In the model, these savings or resources are alternatively channeled to expand public investment, public consumption, or both in an equally weighted scheme.

One of the main features of the model is the production function that introduces the combined effects of public capital, private capital, and labor on output. In the model, the domestic good is assumed to be an imperfect substitute for foreign good. The price of domestic good is determined through equilibrium between supply and demand. The model also accounts for changes in relative prices. In addition, it explicitly captures the link between additional public resources and public investment, which is essential to analyze the possible impacts of debt cancellation on growth.

The discussion of the framework starts with the production function. Then, the components of aggregate demand (consumption, investment, and imports) are introduced. The government budget constraint and the balance of payments follow. The equilibrium condition of the market for domestic goods and the savings-investment balance are presented last.

III.1. Production side and labor

The model assumes that a single homogeneous good is produced domestically, and imperfectly substitutable to an imported good. The production requires labor (LAB), private capital (KP), and public capital (KG):

$$Y = f(\text{LAB}, \text{KP}, \text{KG}),$$

where Y is production of domestic goods. The public capital stock is introduced in the production function because this capital stock is essential to raise the productivity of private capital and labor (Ayogu, 2007; Agénor et al., 2008). The model adopts a two-stage nested CES production structure to explicitly account for differences in the degree of substitutability between private factors of production and public capital. At the first level, the supply of labor (LAB) and the stock of private capital (KP) produce the composite input (KL):

$$\text{KL} = \text{AKL} \cdot [\beta_{\text{KL}} \cdot \text{LAB}^{-\rho_{\text{KL}}} + (1 - \beta_{\text{KL}}) \text{KP}^{-\rho_{\text{KL}}}]^{-1/\rho_{\text{KL}}} \quad (1)$$

where $\text{AKL} > 0$ (capturing technological improvements), $\beta_{\text{KL}} \in (0,1)$, and $\sigma_{\text{KL}} = 1/(1+\rho_{\text{KL}})$ denotes the elasticity of substitution between LAB and KP. At the second level, the composite input, KL, and public capital, KG, are combined to produce domestic output:

$$Y = \text{AY} \cdot [\beta_{\text{Y}} \cdot \text{KL}^{-\rho_{\text{Y}}} + (1 - \beta_{\text{Y}}) (\text{KG})^{-\rho_{\text{Y}}}]^{-1/\rho_{\text{Y}}} \quad (2)$$

where $\text{AY} > 0$ (capturing technological improvements), $\beta_{\text{Y}} \in (0,1)$, and $\sigma_{\text{Y}} = 1/(1+\rho_{\text{Y}})$ denotes the elasticity of substitution between KL and KG. This domestic output is either exported or consumed domestically:

$$\text{PY} \cdot Y = \text{PD} \cdot \text{DOM} + \text{PX} \cdot X \quad (3)$$

where PD is the domestic price of domestically produced goods, PX is the price of exported goods, and PY is the net output price. It is assumed that the allocation of domestic output between exports and domestic

consumption follows a constant elasticity of transformation function. Based on this function, the allocation of output between exports and domestic sales satisfies:

$$X/DOM = \{(PX/PD) \cdot [(1 - \beta_D)/\beta_D]\}^{\sigma_D} \quad (4)$$

where $\beta_D \in (0,1)$ (the share of exports) and $\sigma_D = 1/(\rho_D - 1)$, with $1 < \sigma_D < \infty$ measuring the elasticity of transformation between exports and domestic sales.

Labor is assumed to be growing at a constant rate, n :

$$LAB = (1+n)LAB_{-1} \quad (5)$$

III.2. Households

The representative household earns gross domestic product, GDP, and unrequited net transfers from abroad, UTR\$:

$$YTOT = GDP + ER \cdot UTR\$ \quad (6)$$

where ER is the official nominal exchange rate.

Disposable income (YDISP) is defined as total income earned (YTOT) minus taxes paid (TAX):

$$YDISP = YTOT - TAX \quad (7)$$

Private consumption (CP) is calculated by subtracting savings (s is the saving rate) from disposable income, YDISP:

$$CP = (1 - s) \cdot YDISP / PQ \quad (8)$$

where PQ is the composite price of goods sold domestically, which will be defined later.

Private investment is assumed to be a function of the growth rate, $\Delta Y/Y_{-1}$, public capital stock (KG) and foreign external debt ($ER \cdot FdebtG$):

$$PQ \cdot IP / GDP = f(\Delta Y/Y_{-1}, (PQ \cdot KG / GDP), (ER \cdot FdebtG / GDP)) \quad (9)$$

The accumulation of the private capital stock is private investment in period $t-1$ plus the non-depreciated private capital stock from $t-1$:

$$KP = IP_{-1} + (1 - \delta_P)KP_{-1} \quad (10)$$

It is assumed that it takes a year to make private investment productive.

III.3. Government

Government revenues are derived from taxes and foreign assistance either in the form of loans or grants. The government spends the derived income on goods and services, including public investment. It also pays

interest on loans. Given that domestic sources of government deficit financing are very limited, it is assumed that the budget deficit is financed mainly through foreign borrowing.

The government budget balance (GBAL) is calculated by adding revenue (REV) and aid (AID\$) netted out of total government expenditure (GTOT):

$$GBAL = REV + ER \cdot AID\$ - GTOT. \quad (11)$$

Foreign aid is assumed to be a constant share of GDP, where $ER \cdot AID\$ = GDP \cdot \theta_{AID}$.

Total government expenditure includes government current spending (CG), public investment (IG) and interest payment ($RG^* \cdot ER \cdot FdebtG_{-1}$) on external debt, and interest payment ($RDG^* \cdot DdebtG_{-1}$) on domestic debt:

$$GTOT = PQ \cdot (CG + IG) + RG^* \cdot ER \cdot FdebtG_{-1} + RDG^* \cdot DdebtG_{-1} \quad (12)$$

where $FdebtG$ is the stock of foreign public debt, RG^* the interest rate on that debt, and RDG is the interest rate on domestic debt. Interest rates are assumed to be exogenous.

Government revenue is derived from taxes, TAX, and non-tax income, NTAX (public enterprises and returns on investment incomes):

$$REV = TAX + NTAX. \quad (13)$$

Current public spending is taken as a constant share of GDP:

$$PQ \cdot CG = \theta_{CG} \cdot GDP, \quad (14)$$

where θ_{CG} is the constant share of current spending in GDP.

Public investment (IG) is also assumed to be constant as a share of GDP:

$$PQR \cdot IG = \theta_{IG} \cdot GDP, \quad (15)$$

where θ_{IG} is the share of public investment in GDP.

The public capital stock (KG) grows through the accumulation process, adding public investment in $t-1$ to non-depreciated public capital stock in period $t-1$:

$$KG = IG_{-1} + (1 - \delta_G)KG_{-1}. \quad (16)$$

where δ_G is the depreciation rate. The capital accumulation process assumes that it takes a year to make public investment productive.

Given that domestic financial resources are very limited, the budget deficit is assumed to be financed by foreign transfers, FG (in U.S. dollars):

$$FG = (-GBAL)/ER. \quad (17)$$

Public external debt accumulates, adding foreign transfers in period t to the debt stock in the previous period $t-1$:

$$FdebtG = FG + FdebtG_{-1}. \quad (18A)$$

Assuming that the government can also borrow in the domestic financial markets (domestic debt, DdebtG), and it accumulates as follows, where DG is new borrowing in domestic markets, added to the stock of domestic debt:

$$DdebtG = DG + DdebtG_{-1}. \quad (18B)$$

III.4. Balance of payments

The balance of payments includes trade balance, interest payment, unrequited transfers, foreign aid, and the change in official reserves:

$$PX \cdot X - PM \cdot M - RG \cdot FdebtG_{-1} + UTR\$ + AID\$ + FG - \Delta RES = 0 \quad (19)$$

Official reserves are kept as a constant multiple ϕ_{RM} of current nominal months-of- imports:

$$RES = \phi_{RM} PM \cdot M / 12 \quad (20)$$

III.5. Market equilibrium and prices

The market equilibrium assumes the equivalence of supply (Q) and demand:

$$Q = CP + CG + IP + IG \quad (21)$$

The supply of goods to the domestic market is determined through a combination of imports and domestic sales of the domestic goods, DOM. This function produces the following first-order condition:

$$M/DOM = \{(PD/PM) \cdot [(1 - \beta_{DM})/\beta_{DM}]\} \sigma_{DM}, \quad (22)$$

where $\beta_{DM} \in (0,1)$, and $\sigma_{DM} = 1/(1+\rho_{DM})$ is the elasticity of substitution between the domestic and imported goods, and PM is the domestic price of imported products.

The price charged in the domestic markets (PQ) is determined through a function combining the price of the domestically produced goods and the price of imported goods:

$$PQ = [\beta_{DM} \cdot PD^{1-\sigma_{DM}} + (1 - \beta_{DM}) \cdot PM^{1-\sigma_{DM}}]^{1/(1-\sigma_{DM})}. \quad (23)$$

The equilibrium price of domestically produced goods sold in the domestic market is defined as

$$PDEQ = (PQ \cdot Q - PM \cdot M) / DOM. \quad (24)$$

The price of the domestic good, PD, adjusts gradually to its equilibrium value:

$$PD = \lambda_{PD} \cdot PDEQ + (1 - \lambda_{PD}) \cdot PD_{-1} \quad (25)$$

where $\lambda_{PD} \in (0,1)$ measures the speed of adjustment.

The domestic price of exported goods (PX) is given by

$$PX = ER \cdot PX^*, \quad (26)$$

where ER is the nominal exchange rate and PX^* the world price of exports (assumed exogenous).

The domestic price of imported goods is:

$$PM = ER \cdot PM^*, \quad (27)$$

where PM^* the world price of imports (assumed exogenous).

The price of output is assumed to be numéraire,:

$$PY = 1. \quad (28)$$

III.6. Gross domestic product

Nominal gross domestic product is the summation of private consumption (CP), public consumption (CG), public investment (IG), private investment (IP), all converted in nominal terms by multiplying them by PQ, and adding net exports to the summation ($ER \cdot (PX^* \cdot X - PM^* \cdot M)$):

$$GDP = PQ \cdot (CP + CG + IP + IG) + ER \cdot (PX^* \cdot X - PM^* \cdot M). \quad (29)$$

IV Simulation Results

The model is applied to Ethiopia, one of the highly indebted poor countries in Sub-Saharan Africa. Ethiopia reached the HIPC Completion Point in 2004. Following that accession to debt relief, the ratio of net present value of its debt to exports declined from 284 at Decision Point to 150 after the Completion Point (World Bank, 2006).

This section is divided into three parts: the first one deals with the calibration of parameters underlying the proposed model. Then, the baseline simulation is discussed, followed by policy experiments.

IV.1 Calibration of parameters and projection of exogenous variables: Most of the parameters used in the simulations are taken from Agénor et al. (2008), because their model has been applied to the same country. Furthermore, by extending the application of their results, we assume that the parameters are relatively stable over time. The values of the parameters are given in Table 1A in the Annex. The behavioral equations are based on econometric regressions obtained using Ethiopia's observable variables in the simulations. Equation (9) provides the estimate of private capital accumulation expressed as a percentage of GDP in real terms. The estimated parameters for Equation (9) are:

$$PQ \cdot IP / GDP = (0.03 \cdot \text{Growth of } Y + 0.3 \cdot (KG \cdot PQ / GDP) - 0.003 \cdot (FdebtG \cdot ER / GDP)).$$

Given that the base year is 2008 (because most complete observable data belong to that year), the projections are done for the period 2009-2030. The population growth rate (n) is taken equal to its 2008

value, which is 2.26%.¹³ Given that n is exogenous, POP is projected as $POP = POP_{-1} \cdot (1+n)$. The labor force is assumed to be growing at the same rate. Since PY is numéraire, it is projected as 1. Interest rates (RG^*) are taken equal to 1 percent, assuming loans to low-income countries are mainly concessional.

We assumed that there is no change in terms of trade throughout the simulation process.¹⁴ Thus the rates of change in both PM^* and PX^* are projected such that the growth rates of these two variables are equal. Tax revenues are based on private production and income projections. The effective tax rate is approximately 10.4 percent of GDP. The share of domestic borrowing, θ_{DB} , is assumed to be constant at 1 percent of GDP, given the small size of domestic financial markets. The share of foreign aid in GDP (θ_{AID}) takes its value in 2008. In the baseline simulation, it is projected at the constant rate (9%), but in experiments it takes different values.

The share of current public spending (θ_{CG}) is taken as 23% of GDP, which is the 2008 value. The baseline simulation values are derived from the estimated share of public spending in 2008. However, that share takes different values in the experiments. Another important variable in the model is public investment. The share of public investment (θ_{IG}) is assumed to be equal to its 2008 value, which is 5.9% of GDP. Similar to current government spending, public investment is also assumed to remain constant in percent of GDP throughout the projections and taking different values in the experiments.

Although most exogenous variables are projected outside the model, a small number of exogenous variables are projected within the simulation program because they are assumed to be in constant shares of endogenous variables. Given the shares presented above, domestic borrowing (DB), foreign aid (AID\$), foreign borrowing (FP), transfer from abroad (UTR\$), current public spending (CG), and public investment (IG) are all in constant shares of GDP, and the projections of these variables are based on simulated GDP values between 2009 and 2030.

Another important specification is the construction of public and private capital stocks. Because historical data series for capital stocks are not available for Ethiopia, the initial capital stocks are calculated assuming that initial public and private capital stocks are zero in 1980. Then the stocks are calibrated in the following years such that $KP_t = (1 - \delta P) \cdot KP_{t-1} + IP_{t-1}$ where $\delta P = 4\%$ is the depreciation rate, IP is real investment, and KP private capital stock.¹⁵ The public capital stocks are calibrated following the same procedure. But the depreciation rate in this case is taken as 2.5%.

IV.2 Baseline projection: Simulation results are classified into two main categories: baseline projection and experiments. The baseline projection shows how Ethiopia's economy would evolve if current economic trends continue into the future.¹⁶ Under that assumption, exogenous variables are projected to remain as close as possible to the prevailing economic conditions throughout the simulation. For example, there is no shock to terms of trade, or to private or public investment, all of which can be important drivers of growth and are highly affected by business cycles. The use of 2008 as base period requires making a certain number of assumptions for the policy and other exogenous variables over the period 2009-2030.

¹³ The average growth rate of population in Sub-Saharan Africa was 2.3% on average in 2008.

¹⁴ However, this may be a rather strong assumption, especially in light of the recent global economic and financial crisis. **Most primary-commodity-dependent countries were affected during the second round of the global downturn via the terms of trade channels** [IMF (2009a)].

¹⁵ For depreciation rates, see Agenor et al. (2008) and Bayraktar and Fofack (2007).

¹⁶ It should be noted that the results need to be interpreted carefully, since they are based on a simulation model with a certain number of assumptions on parameterization.

Table 2A in the Annex shows the baseline simulation results from the calibrated model. The results are investigated in turn for the external sector, government sector, prices and exchange rates, and some additional items of interest. The external sector shows an improvement of the current account balance, largely due to a rapid depreciation of the local currency. Private unrequited transfers are assumed to be constant in percent of GDP. Net income flows declined, due mainly to increasing interest payments on rising external debt. The capital account projection declines slightly, despite increasing external borrowing needs following the deterioration of the trade balance.

Similarly, items under the government sector (second section of Table 2A) are expressed in percent of GDP. Total tax revenue is on a declining trend, owing in part to falling domestic production and income. Since the tax base is not growing at the desired level, the government is unable to collect enough revenue to finance its expenses, even though the effective tax rate is almost constant throughout the projections. The share of non-tax revenues is constant at 6.5% of GDP. Current and capital expenditures are both assumed to be constant at 23% and 5.9% of GDP (their actual values in the baseline year), respectively.

Even though the interest rate on foreign debt is assumed to be low, at 1%, interest payments are increasing continuously throughout the simulation process due to rising stock of external debt. The fiscal balance stays negative around 3.5% of GDP due in part to persistence under a narrow tax base. In a context of limited financial deepening and domestic financial markets, only 1 percentage point of this deficit is assumed to be financed domestically; as a result, the government of Ethiopia borrows externally on concessional terms to close the financing gap.

The third section of Table 2A focuses on price and exchange rate movements and related items. Note that the composite price index is trending upward while foreign exchange rate declines, reflecting a nominal depreciation. As expected, the depreciation should lead to an improvement of the trade balance following the decrease of imported goods. The last section of Table 2A (additional items of interest) shows a slight increase in the growth rates of real GDP per capita, reflecting low savings and investment rates. In effect, at 0.9% of GDP, private savings are very low in Ethiopia, even by developing countries' standards.

Interestingly, the ratio of external debt to GDP increases markedly, mainly due to persistently large fiscal deficits in the post-HIPC era. Paradoxically, one of the main objectives of the HIPC Initiative was to reduce the stock of external debt and interest payments accruing to low-income countries, ultimately averting the risk of another sovereign debt crisis. On the basis of the projections, debt cancellation alone may not bring a permanent solution to the external debt burden confronting the majority of low-income countries in Sub-Saharan Africa. As governments cannot raise more tax revenues or borrow domestically to bridge the ever-growing financing gap, they are naturally inclined to rely more and more on external sources of financing.

The projection for Ethiopia shows that the share of external debt in GDP is expected to rise from 18% in 2011 to 66% in 2030.¹⁷ This impressive accumulation of projected external liabilities (at least according to projections) in the post-HIPC will result in higher external interest payments, ultimately curtailing the number of resources that the government can deploy to support growth and poverty reduction.

Another interesting feature of the model, which has significant policy implications, is its ability to estimate the number of years it would take under the baseline scenario to double real per capita income in Ethiopia.

¹⁷ For Ethiopia, World Bank (2006) estimates the net value of external debt in percent of GDP as 29% in 2010 under the worst-case scenario. The estimation is based on the assumption of less favorable terms of borrowing. But given that the definition of debt and the estimation methodologies are different from what is presented here, they are not comparable.

Assuming that the Ethiopian economy would continue to grow at an average rate of 0.8% per annum over the projected period, it would take about 86 years for real GDP per capita to double (see Table 1). This result suggests that Ethiopia may be locked into a vicious poverty trap, unless a massive inflow of resources creates the fiscal space required for sustained investments and economic growth. The next sub-section explores the potential growth and welfare benefits of such a “big push” option.

IV.3 Policy experiments: The experiments are designed to generate additional government revenues that can be allocated to current spending, public investment, or a combination of both. It is assumed that the additional revenues are derived from lower interest payments on external debt following relief under the HIPC Initiative or from a substantial increase in capital inflows in the form of foreign aid. These experiments are compared against the baseline projections discussed above, with the growth and welfare effects measured by the percentage deviations from the baseline. The focus of policy experiments is to assess the growth effects of improved fiscal space in a context of reduced interest payments on external debt.

Analytically, the potential growth and welfare effects of lower interest payments on external debt mainly operate through the fiscal channel, especially to the extent that increased fiscal space and government revenues could raise the prospects for investments in support of growth. However, even in a context of improved fiscal space, growth may not automatically follow. Growth prospects are influenced by the composition of public spending as well as the efficiency in the allocation of additional resources from debt relief (Gupta et al., 2005; Fofack, 2010). Three different experiments—reflecting the various forms of public spending allocation—are used to investigate the growth and welfare effects of lower interest payments on external debt.

The current level of interest payments on external debt owed to external creditors by the government of Ethiopia is about 1% of GDP, reflecting the disproportionately large share of concessional financing of its external liabilities. Although highly hypothetical, especially given the already low interest rate on its external debt, the first experiment explores the potential growth and welfare implications of an even lower interest rate. It should be noted that given the rapidly growing scale of external debt in the baseline projections, the drop in interest rates may significantly increase public savings, which can then be allocated toward increased public spending in the form of current and capital expenditure.

The first experiment assumes a 50% reduction in interest payments on external debt in the post-HIPC era, with the totality of additional revenues fully allocated to current spending. The model is used to assess the implications of that fully current expenditure on long-term growth projections. Figure 4 provides the results of this first experiment in the form of a percentage deviation from the baseline scenario. Note that under this first experiment, per capita GDP growth rate increases steadily, largely on account of rising government spending.

These results may also be viewed as incidence analysis of public spending allocation on long-run growth. In that context, several alternative scenarios are also considered in the deployment of additional revenues. Most notably and contrasting the fully current expenditure option, the totality of additional revenues from lower interest payments on external debt is allocated to the financing of public investments. The incidence of public spending allocation under this second alternative is more significant and consistently superior to the fully current expenditure option throughout the entire simulation period (Figure 4). Indeed, the absolute deviations from the baseline are much larger.

The potential growth and welfare returns under this hypothetical scenario are equally significant. In particular, the simulations show that the full allocation of additional revenues to capital expenditure expansion could result in over .44 percentage points deviation from the baseline, suggesting that growth rate would be .44 percentage points higher. Predictably, the long-run incidence of public spending allocation on growth is slightly lower for the intermediate option, which allocates the additional revenues from lower interest payments equally to both recurrent spending and public investments (Figure 4).

Despite the apparent positive incidence of public spending on long-run growth under the different allocation options, the overall welfare and income effects remain very low, reflecting in part, the modest level of additional revenues and, most important, the poor initial conditions in Ethiopia—the low level of income per capita and high growth volatility (World Bank, 2003; UNECA, 2007; Go and Page, 2008). Under the best-case scenario, when the totality of additional savings is allocated to public investments, it could take about 70 years for per capita income to double, just about 16 years lower than under the baseline scenario (Table 1).

The second set of experiments explores the growth and welfare effects under a “big push” option—massive inflows of resources because of rapid increase in foreign aid. In the absence of a structural transformation of the production possibility frontiers and hence persistency under a narrow tax base, Ethiopia remains highly dependent on foreign aid, which reached 9% of GDP in 2008 (Alemu, 2009).¹⁸ The model estimates the magnitude of growth and welfare incidence of hypothetical increased in foreign aid under different public spending allocation options. Simulations show that GDP per capita growth increases proportionally with foreign aid (see Figure 4). These results are consistent with findings in the literature. Foreign aid and external indebtedness is generally thought to be growth enhancing (Pattillo et al., 2002).

Contrasting the fully recurrent and capital expenditure expansion options, our experiment shows that the largest gains in terms of per capita GDP growth are associated with the latter option. In particular and irrespective of the scale of additional capital inflows (foreign aid), the potential growth and welfare returns from the fully capital expenditure expansion option are consistently higher. When foreign aid hypothetically increases from its current level of 9% of GDP to about 15%, per capita GDP growth rises consistently, exceeding the baseline by more than 4 percentage points by 2030 (Figure 5: Panel A).

Even when the hypothetical increased inflows of external assistance in the form of foreign aid (in the magnitude of 15% of GDP) is fully allocated to current spending, the potential returns in terms of growth and welfare remain significant, though markedly much smaller. Indeed, under this second alternative option, GDP per capita remains on a consistent growth path, and is projected to exceed the baseline by at most 3 percentage points in 2030 (Figure 5: Panel A).

Likewise, even when the hypothetical increase in flow of foreign aid is reduced to 12% of GDP, the potential growth and welfare returns remain significant and rise consistently throughout the simulation period (Figure 5: Panel B). However, irrespective of the public spending allocation options (fully recurrent, capital, or both), the absolute deviations of per capita GDP growth is consistently lower (below 3% of GDP). Furthermore and consistent with the earlier simulations, which assume a much higher level of foreign aid, the growth target is also lower under the fully current expenditure option. In particular, per capita GDP is projected to exceed the baseline by less than 1 percentage point by 2030. The intermediate scenario, which

¹⁸ At about 9% of GDP, foreign aid is close to historical trends. In effect, over the past decade (1999-2008), foreign aid as a percentage of GDP has averaged 8.6%.

equally splits the hypothetical increase in foreign aid between current and capital expenditure, is also significant and better than the fully current expenditure expansion option.

The income and welfare benefits of the hypothetical “big push” model are also significant under the fully capital expenditure expansion option. In particular, where foreign aid rises to 15% of GDP and remains high throughout the simulation period, and with additional revenues channeled to finance public investment, it would take about two decades for per capita real GDP to double—over 50 years faster than under the baseline scenario (see Table 1). The results are also impressive under the fully current expenditure option, though remarkably lower than under the sustained accumulation of the capital stock option. Under the fully current expenditure option, per capita real GDP could double in about five decades.

The much higher incidence of the fully capital expenditure expansion option over the alternative current spending option is expected. Under the well-established complementarity argument, public investment expansion has the potential to raise the level of private capital stock, and then directly impact private production and aggregate output on the supply side. In contrast, the fully current expenditure option has a limited impact on the economy because it affects private production indirectly, specifically through the demand side. Moreover, it is exposed to large leakages, especially in primary commodity countries, which in the absence of economic diversification rely heavily on imports of final consumption and manufactured goods.

V Conclusion

This paper analyzes the dynamics of growth in the post-HIPC era in Sub-Saharan Africa. It is written at a time of a growing wave of euphoria where the resumption of positive economic growth rates—fueled in part by favorable terms of trade and expanding fiscal space—have led scholars and policymakers alike to liken Africa’s recent performances to the impressive growth rates and economic transformation enjoyed by Asian emerging market economies over the past decades. The paper is also written at a time when Sub-Saharan African post-HIPC Completion Point countries have been witnessing a renewed deterioration of their external debt threshold indicators, a path that could have significant adverse effects on macroeconomic stability and long-run growth.

Against this backdrop, the first part of the paper contrasts the growth performance of African HIPCs with that of Asian emerging market economies. In spite of growth resumption in the subset of African HIPCs, their overall performance in terms of income growth and welfare pales in comparison to that of Asian emerging market economies. The remarkable contrast is most notably reflected in the continued widening income gap between the two sets of countries. In particular, since the late 1990s, the income gap between Asian emerging market economies and African post-HIPC completion point countries has grown unabated.

In addition to contrasting income trends in the short run, the paper uses a simple macroeconomic model that accounts for the financing of the deficit and the external debt profile of the post-HIPC era to assess long-run growth prospects in Sub-Saharan Africa. The policy experiments, which compare long-run estimates with baseline projections, are derived from the model to estimate the potential growth and welfare returns under certain hypothetical assumptions, including reduction of interest payments on external debt and full allocation of additional revenues from increased foreign aid to either capital or current expenditure expansion.

The model is applied to Ethiopia, one of the post-HIPC Completion Point countries in the region. Baseline projections from the model do indeed point to income stagnation in real terms. They also reveal the persistence of large fiscal deficits and deterioration of external debt indicators. In effect, on the basis of these baseline projections, the share of external debt in GDP could rise from 18% in the immediate post-HIPC completion point to 66% by 2030, *ceteris paribus*. Similarly and consistent with the baseline estimates, the long-term projections of per capita real income support the income stagnation hypothesis. Under the current growth path, it could take more than eight decades for per capita real income to double in Ethiopia.

However, policy experiments that assess the incidence of public spending allocation on long-run growth under the hypothetically reduced interest payments on external debt and/or exceptionally increased foreign aid produce large welfare returns. Long-term growth projections are particularly impressive under the hypothetical “big push” option—significant increases in foreign aid—and much lower under the reduced interest payments on external debt alternative. Still, even under the hypothetical “big push,” the composition of public spending allocation matters. The fully capital expenditure expansion results in consistently higher growth rates, further highlighting the critical role of public investments for long-run growth in the region. Future research will explore the interaction between public capital accumulation and long-term debt indicators in the region.

Reference:

- Agénor, P.-R., Bayraktar, N., & El Aynaoui, K. (2008). Roads out of poverty? Assessing the links between aid, public investment, growth, and poverty reduction. *Journal of Development Economics*, 86 (2, June), 277-295.
- Akyuz, Y., & Gore, C. (2001). African economic development in a comparative perspective. *Cambridge Journal of Economics*, 25, 265-288.
- Alemu, G. (2009). A case study on aid effectiveness in Ethiopia. Wolfensohn Center for Development Working Paper 9 (April 2009).
- Artadi, V. E., & Sala-i-Martin, X. (2003). The economic tragedy of the 20th century: growth in Africa. National Bureau of Economic Research Working Paper No. 9865.
- Ayogu, M. (2007). Infrastructure and economic development in Africa: a review. *Journal of African Economies*, 16 (Sup. 1), 75-126.
- Bayraktar, N., and Fofack, H. (2007). Specification of investment function in Sub-Saharan Africa. World Bank Policy Research Working Paper No. 4171.
- Bhagwati, J. (2010). Time for a Rethink. *IMF Finance and Development*, September 2010, 47 (3).
- Boote, A., & Thugge, K. (1997). Debt relief for low-income countries and the HIPC initiative. IMF Working Paper, WP/97/24. The International Monetary Fund.
- Devarajan, S., & Shetty, S. (2010). Africa: leveraging the crisis into development takeoff. *Economic Premise*, September 2010(30). The World Bank.
- Easterly, W. (2002). How did heavily indebted poor countries become heavily indebted? reviewing two decades of debt relief." *World Development*, 30 (10), 1677-1696.
- Easterly, W., & Levine, R. (1997). Africa growth tragedy: policies and ethnic divisions. *Quarterly Journal of Economics*, 112 (4).
- Elbadawi, I., Ndulu, B., & Ndung'u, N. (1997). Debt overhang and economic growth in Sub-Saharan Africa. *External Finance for Low-Income Countries*, ed., Iqbal, Z., & Kanbur, R.
- Fofack, H. (2009). Determinants of globalization and growth prospects for Sub-Saharan African countries. World Bank Policy Research Working Paper No. 5019. The World Bank Group.
- Fofack, H. (2010). Conflicts and returns to stability in developing countries: a comparative analysis. World Bank Working Paper No: 5428 (September 2010).
- Go, S. D., Harmsen, R., & Timmer, H. (2010). Regaining Momentum. *IMF Finance and Development*, 47 (3), September 2010.
- Go S. D., & Page, J. (2008). *Africa at a turning point? growth, aid and external shocks*. World Bank Publications: Washington D.C.
- Gupta, S., Clements, B., Baldacci, E., & Mulas-Granados, C. (2005). Fiscal policy, expenditure composition and growth in low-income countries. *Journal of International Money and Finance*, 24, 441-463.
- IMF (2009a). World economic outlook: crisis and recovery. The International Monetary Fund, Washington, D.C.
- IMF (2009b). World economic outlook: sustaining the recovery. The International Monetary Fund, Washington D.C.
- IMF (2010) *Finance and Development* (September).

- Kasekende, L., Brixova, Z., & Ndikumana, L. (2010). Africa: Africa's counter-cyclical policy responses to the crisis. *Journal of Globalization and Development*, 1, (1), Article 16.
- Krugman, P. R. (1988). Market-based debt-reduction schemes. (May 1, 1988). NBER Working Paper No. 2587.
- Maddison, A. (1995). Monitoring the world economy: 1820-1992. Development Centre of the Organization of Economic Cooperation and Development. OECD, Paris, France.
- Nafziger, E. W. (1993). *The debt crisis in Africa*. The Johns Hopkins University Press, Baltimore (1993).
- Nelson, R., & Pack, H. (1999). The Asian miracle and modern growth theory. *The Economic Journal*, 109, 416-436.
- Newfarmer, R. S. (2009). Breaking into new markets: emerging lessons for export diversification. World Bank, publisher.
- Oyelaran-Oyeyinka, O. (2009). Uneven paths of development: innovation and learning in Asia and Africa. Edward Elgar, publisher.
- Parfitt, T. W., and Riley, S.P. (1989). *The African debt crisis*. Routledge, London (1989).
- XPattillo C., Poirson, H., & Ricci, L. (2002). External debt and growth. *IMF Finance and Development*, 39 (2).
- Rogers, H. F. (2010). The global financial crisis and development thinking. World Bank Policy Research Working Paper No. 5353.
- Sala-i-Martin, X., & Pinkovskiy, M. (2010). African poverty is falling much faster than you think! NBER Working Paper No: 15775.
- Singh, A. (2010). Asia leading the way. *IMF Finance and Development*, 47 (2).
- UNECA (2007). *Assessing progress towards the millennium development goals in Africa*. Economic Commission for Africa.
- World Bank (2002). Globalization, growth and poverty: building an inclusive world economy. *World Bank Policy Research Report*. The World Bank Group, Washington D.C.
- World Bank (2003). Ethiopia—country economic memorandum, the World Bank Group: Washington D.C.
- World Bank (2006). Debt relief for the poorest countries: an evaluation update of the HIPC initiative. *The World Bank Independent Evaluation*. The World Bank Group.
- Yueh, L. (2010). A strong China. *IMF Finance and Development*, 47, (2).

Table 1
Ethiopia: Total years needed to double the real GDP per capita

	Average growth rates of real GDP per capita	Total years to double real GDP per capita
<u>Baseline</u>	0.80	86
<u>EXPERIMENT 1</u>		
Foreign interest rates are 50 % lower		
Experiment 1A (all allocated to CG)	0.97	72
Experiment 1B (all allocated to IG)	0.99	70
Experiment 1C (50% allocated to IG, 50% allocated to CG)	0.98	71
<u>EXPERIMENT 2</u>		
Foreign aid is 10 % of GDP		
Experiment 2A (all allocated to CG)	1.07	65
Experiment 2B (all allocated to IG)	1.23	57
Experiment 2C (50% allocated to IG, 50% allocated to CG)	1.14	61
Foreign aid is 12 % of GDP		
Experiment 2D (all allocated to CG)	1.19	59
Experiment 2E (all allocated to IG)	2.04	35
Experiment 2F (50% allocated to IG, 50% allocated to CG)	1.61	43
Foreign aid is 15 % of GDP		
Experiment 2G (all allocated to CG)	1.37	51
Experiment 2H (all allocated to IG)	3.15	23
Experiment 2I (50% allocated to IG, 50% allocated to CG)	2.26	31

Figure 1: Sub-Saharan Africa – External Debt Stocks (in billions of current U.S. dollars)

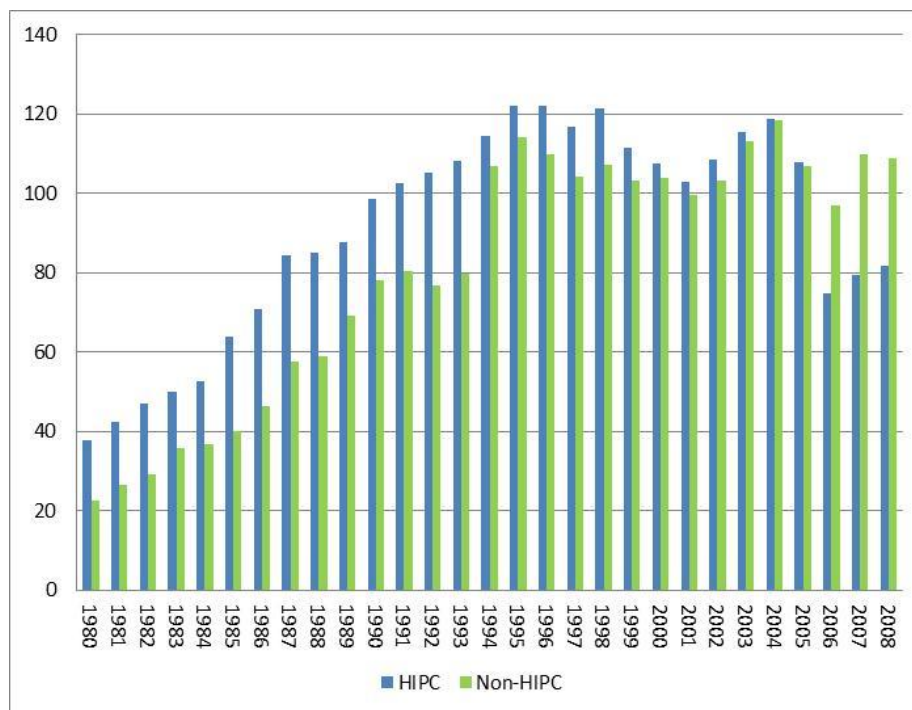
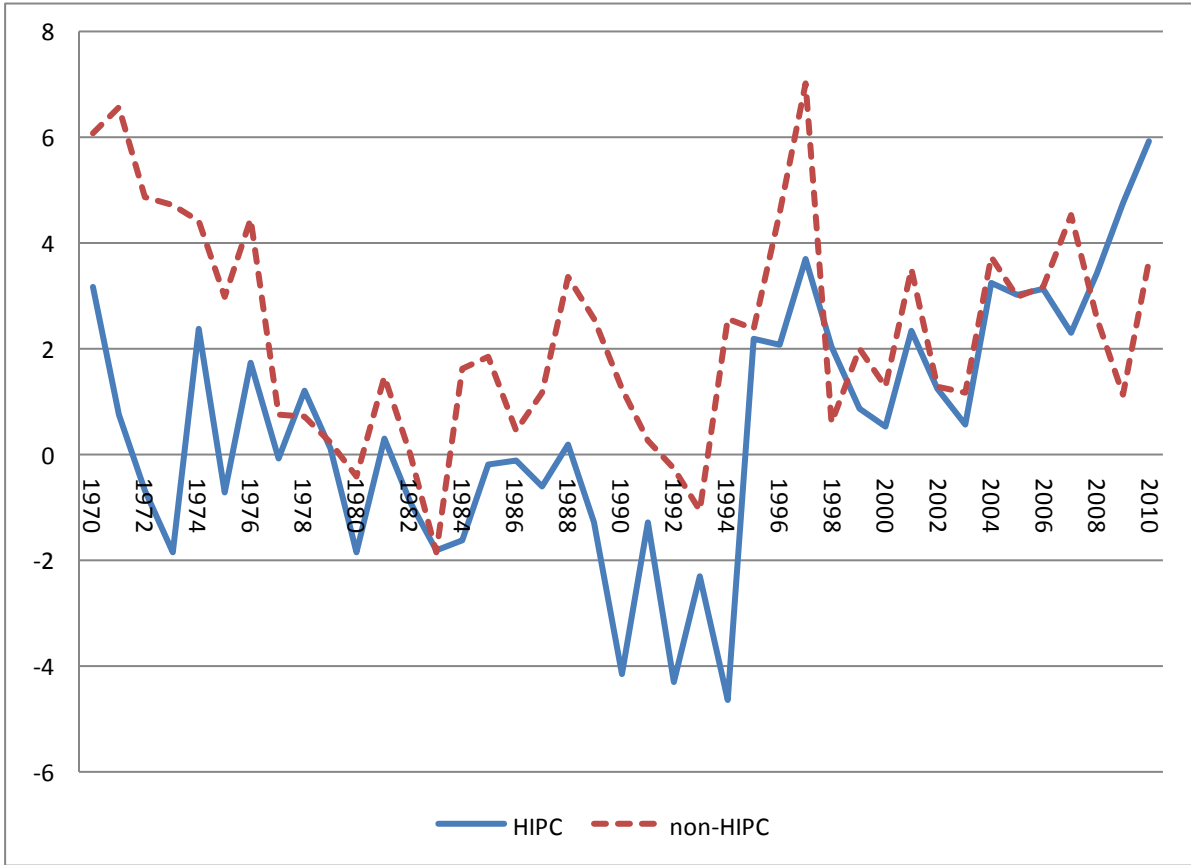


Figure 2: Sub-Saharan Africa – Average Growth Rate of GDP per capita in HIPCs and non-HIPCs (in percent)



**Figure 3: GDP per capita in China versus HIPC in Sub-Saharan Africa
(in constant 2000 U.S. dollars)**

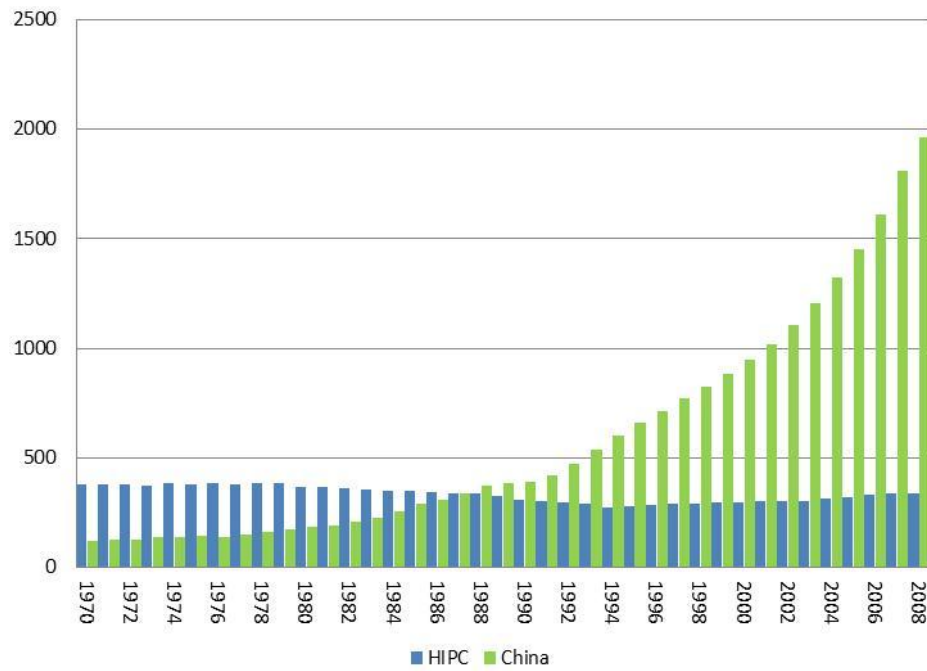


Figure 4: Experiment 1 - Real GDP per capita growth
(int. rate is 50% lower; deviation from baseline)

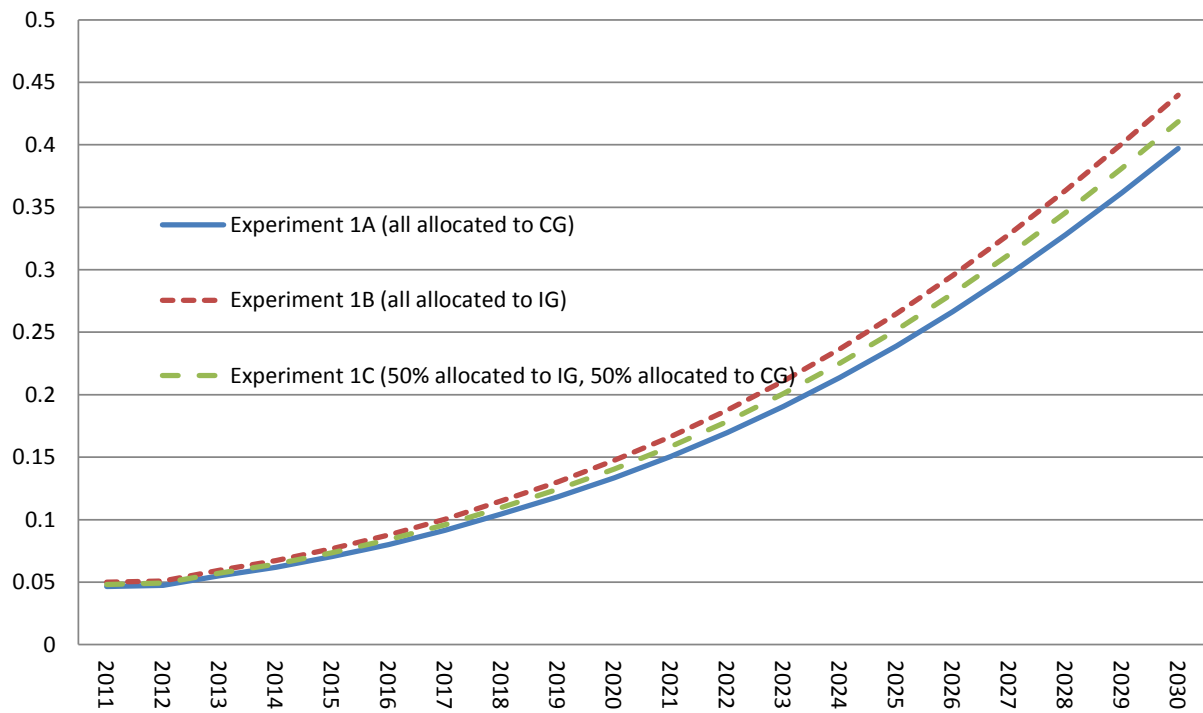
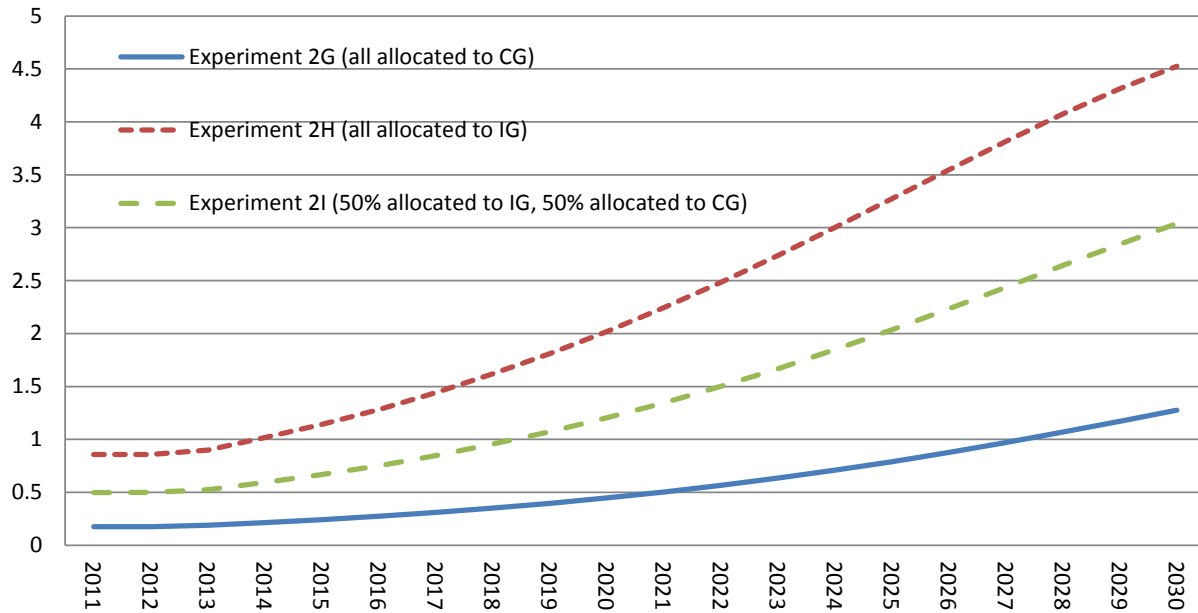
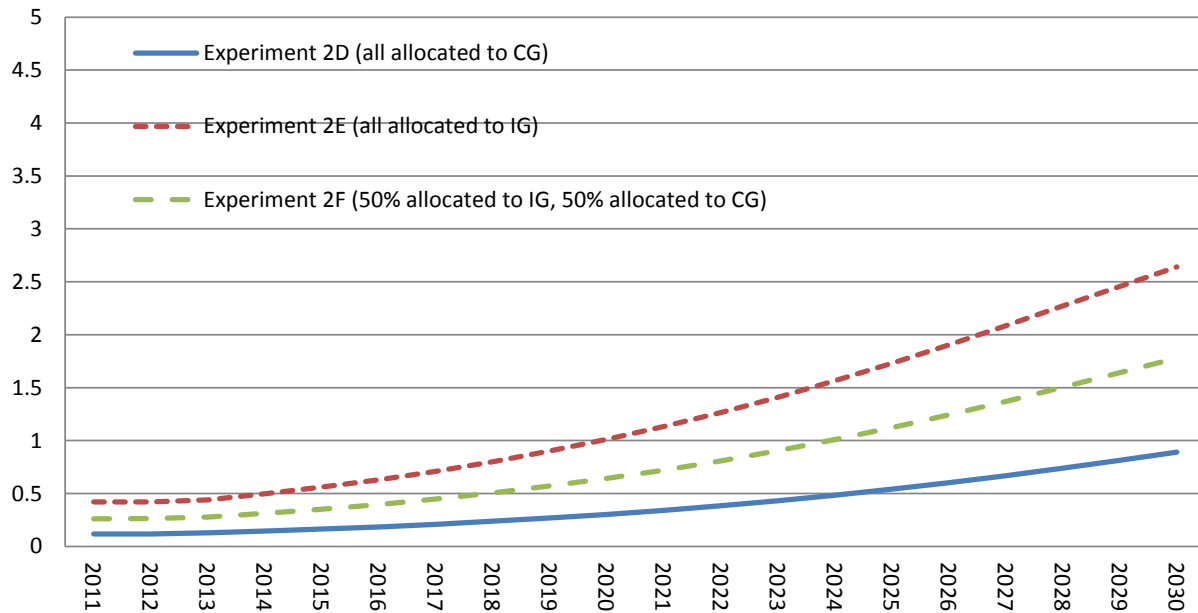


Figure 5: Experiment 2 - Real GDP per capita growth
(higher foreign aid; deviation from baseline)

Foreign aid is 15 % of GDP

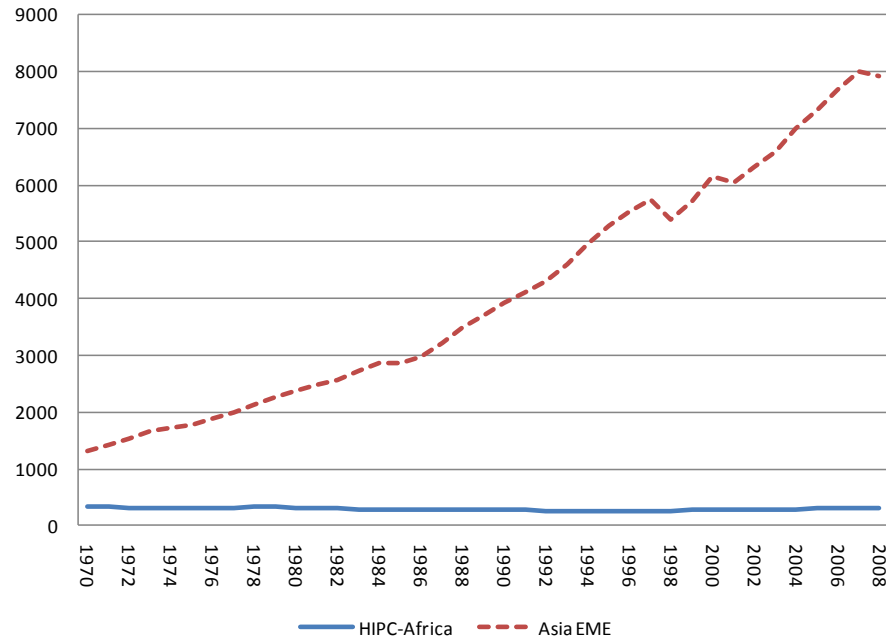


Foreign aid is 12 % of GDP



ANNEX

**Figure 1A: GDP per capita in Emerging Markets of Asia versus HIPC in Sub-Saharan Africa
(in constant 2000 US dollars)**



ANNEX - Table 1A
Calibrated or Imposed Parameters

Parameter	Value
β_{KL}	0.60
β_D	0.13
β_Y	0.85
β_{DM}	0.72
α_{PD}	0.600
λ_{PD}	0.300
ϕ_{RM}	0.760
δ_P	0.040
δ_G	0.025
σ_D	0.300
σ_{DM}	0.300
σ_{KL}	0.400
σ_Y	0.500

Note: The parameter values are taken from Agénor, Bayraktar, and El Aynaoui (2008).

ANNEX - Table 2A
Ethiopia: Baseline, 2011-30

	Years																			
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Balance of Payments (% of GDP)																				
Current account	-15.9	-13.6	-14.1	-14.1	-14.1	-14.2	-14.2	-14.3	-14.4	-14.4	-14.4	-14.3	-14.2	-14.0	-13.8	-13.5	-13.2	-12.7	-12.3	-11.7
Trade balance	-25.0	-22.7	-23.1	-23.1	-23.1	-23.2	-23.2	-23.3	-23.3	-23.3	-23.3	-23.2	-23.0	-22.8	-22.6	-22.3	-21.9	-21.5	-21.0	-20.4
Exports of goods and services	12.3	11.9	11.6	11.6	11.6	11.7	11.7	11.8	11.9	11.9	11.9	11.9	11.9	11.9	11.8	11.7	11.6	11.4	11.2	11.0
Imports of goods and services	37.3	34.5	34.7	34.7	34.8	34.8	34.9	35.1	35.2	35.2	35.2	35.1	34.9	34.7	34.4	34.0	33.5	32.9	32.2	31.4
Private unrequited transfers	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0
Income (net)	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4
Aid	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
Other current account flows (net)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Capital account	-1.8	-1.8	-1.7	-1.7	-1.7	-1.6	-1.6	-1.6	-1.5	-1.5	-1.5	-1.5	-1.4	-1.4	-1.4	-1.4	-1.4	-1.3	-1.3	-1.3
Foreign direct investment	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Public borrowing	2.2	2.3	2.3	2.3	2.4	2.4	2.4	2.5	2.5	2.5	2.5	2.6	2.6	2.6	2.6	2.6	2.7	2.7	2.7	2.7
Other capital inflows	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4	-4.4
Government Sector (% of GDP)																				
Total revenues (including grants)	25.9	25.8	25.8	25.8	25.8	25.8	25.8	25.8	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.7	25.6	25.6	25.6	25.6
Total tax revenues	10.4	10.4	10.4	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.2	10.1
Total non-tax revenues	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5
Foreign aid (grants)	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
Total expenditure	29.1	29.1	29.1	29.1	29.2	29.2	29.2	29.2	29.2	29.2	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3	29.3
Spending on goods and services (total)	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0	23.0
Investment	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.9
Interest payments	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4
Fiscal balance including grants	-3.2	-3.3	-3.3	-3.3	-3.4	-3.4	-3.4	-3.5	-3.5	-3.5	-3.5	-3.6	-3.6	-3.6	-3.6	-3.6	-3.7	-3.7	-3.7	-3.7
Total financing	3.2	3.3	3.3	3.3	3.4	3.4	3.4	3.5	3.5	3.5	3.5	3.6	3.6	3.6	3.6	3.6	3.7	3.7	3.7	3.7
Domestic borrowing	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Foreign financing	2.2	2.3	2.3	2.3	2.4	2.4	2.4	2.5	2.5	2.5	2.5	2.6	2.6	2.6	2.6	2.6	2.7	2.7	2.7	2.7
Prices and Exchange Rate																				
Composite good price (% change)	-0.6	-0.5	1.0	1.0	1.1	1.1	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.1	1.1	1.2	1.3	1.4
Nominal exchange rate (% change)	-0.2	-0.2	-0.3	-0.5	-0.6	-0.7	-0.8	-0.9	-1.0	-1.1	-1.2	-1.3	-1.4	-1.5	-1.6	-1.7	-1.8	-1.9	-2.0	-2.1
Real exchange rate (% change)	-2.3	-2.7	2.1	2.0	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.0	0.9	0.8	0.7	0.6	0.4	0.3	0.1
Additional Items of Interest																				
Real GDP per capita (% change)	1.3	1.7	0.3	0.5	0.5	0.5	0.4	0.4	0.4	0.5	0.5	0.6	0.7	0.7	0.8	0.9	1.1	1.2	1.3	1.5
Private savings rate (% of GDP)	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Private investment (% of GDP)	16.4	16.2	16.1	16.1	16.0	15.9	15.8	15.8	15.8	15.7	15.7	15.7	15.6	15.6	15.5	15.5	15.4	15.3	15.3	15.3
External debt (% of GDP)	17.9	20.1	22.4	24.8	27.1	29.5	31.9	34.4	36.9	39.4	41.9	44.5	47.1	49.7	52.3	54.9	57.6	60.3	63.0	65.7
Interest payment on external public debt (% of exports)	1.2	1.4	1.5	1.7	1.8	1.9	2.1	2.2	2.3	2.4	2.5	2.7	2.8	2.9	3.0	3.1	3.2	3.3	3.4	3.5